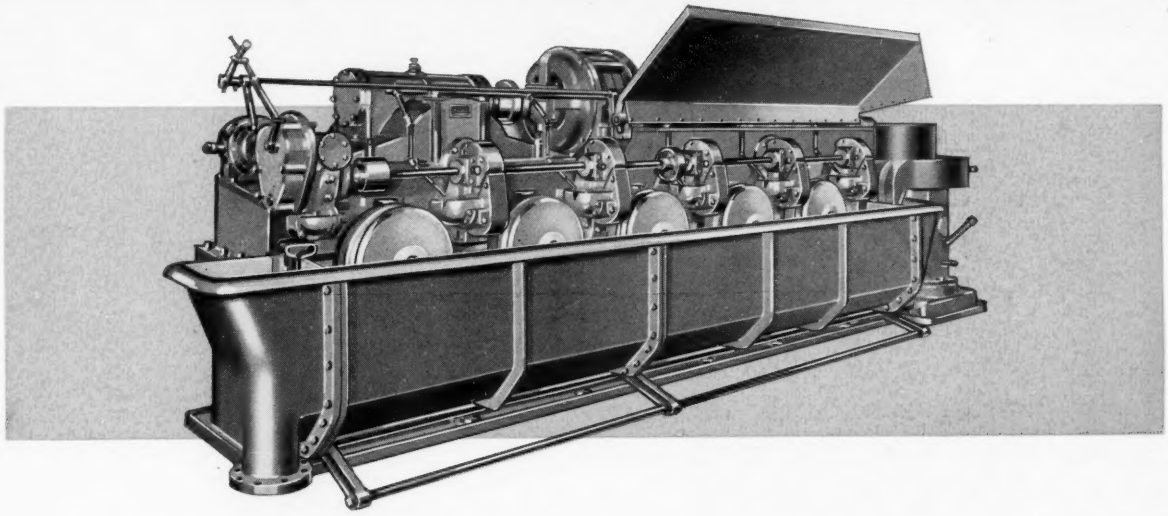
WIRE
& WIRE PRODUCTS

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION



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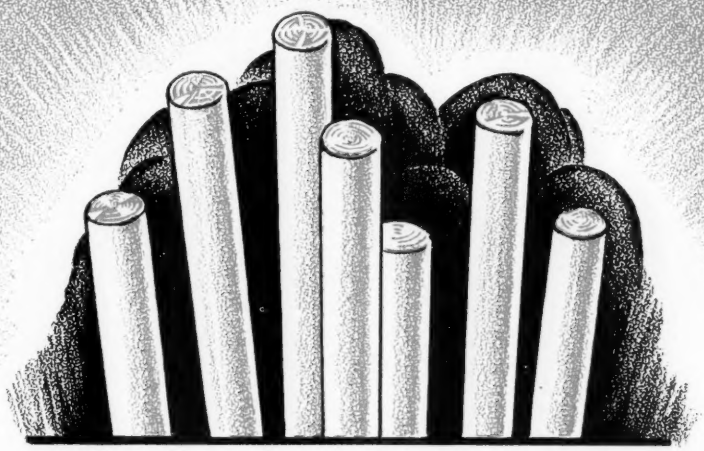

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DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING.

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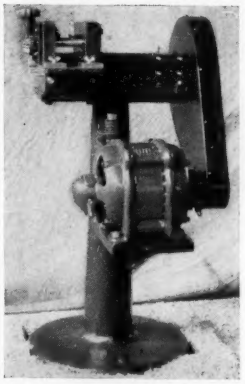

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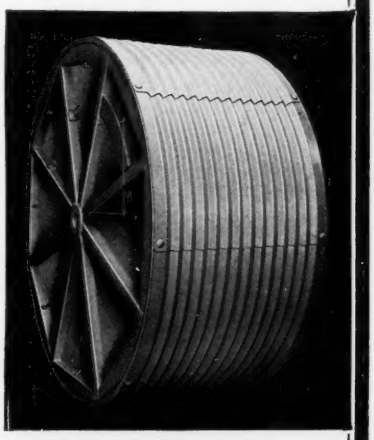

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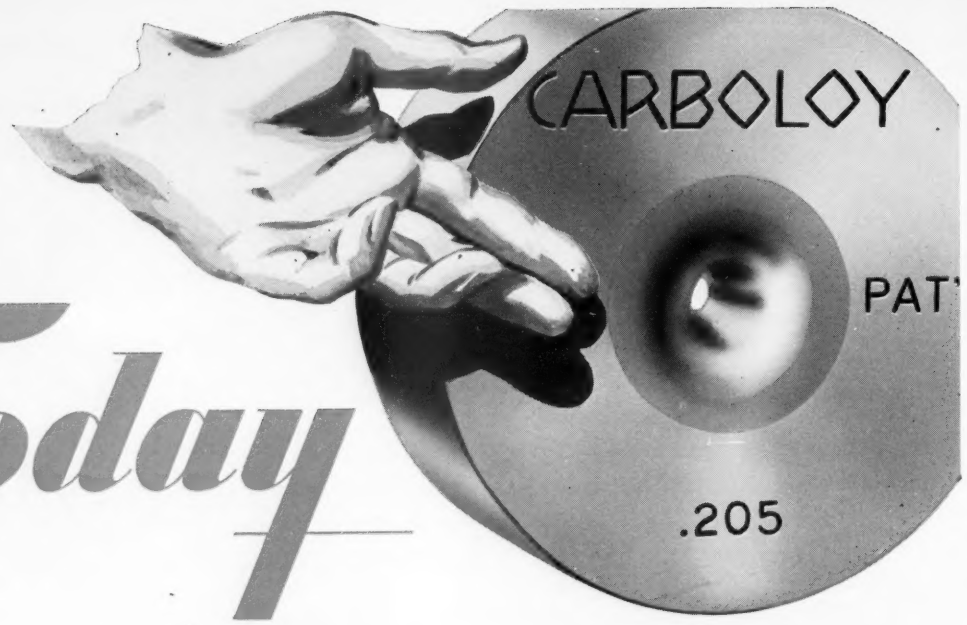

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WIRE & WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 7 AUGUST, 1932 No. 8

High Tension Cable Production

By Otto F. Jagielski

A criticism of some of the mistakes made in processes used in the manufacture of high voltage cable and suggestions as to improvements of such processes. ▼ ▼ ▼ ▼ ▼ ▼

THERE is no branch of the wire industry in which ordinary production operations require such combined technical knowledge as the manufacture of high voltage cable and it is my opinion that not only have many mistakes been made in processes but that many radical improvements can be made in present production methods to give a better product and at the same time lower costs.

✦ ✦ ✦

IT is, of course, the natural tendency of a manufacturer to endeavor to produce a satisfactory product at as low a cost as possible but some of these high tension cable plants have carried this to an extreme and to a point where the quality of the cable produced has been affected.

✦ ✦ ✦

THE manufacture of this type of cable has become very highly specialized and contact with engineers in these plants shows such a divergence of practice in the complex fabricating operations required, that a study of certain operations which could be readily standardized would seem to be profitable.

REQUIREMENTS are far more rigid than in the past; so much so that better machines, better trained labor, improved processes and methods have been recently adopted by many plants. Research work however; is still going on, and greater developments in quality and lowered cost of production are expected as a result. The present research developments are compelling continuous readjustments in equipment and in the near future it is expected that a great part of these cable mills will either have to be re-machined, or have their present machines equipped with new cost reducing devices.

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AMONG the major problems affecting production, the following are of direct and vital interest to all mills.

✦ ✦ ✦

Plant Layout

MANY plants now used for the production of high tension power cable were originally built for other purposes and later changed over to cable plants. This has resulted in many errors in plant layout and design.

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AN illustration of this is a plant which I recently inspected. This mill was three stories high with the department layouts as follows:—On the ground floor, the rod mill, the wire drawing mill and the annealing department; on the second floor, the stranding department and on the third floor the paper taping department; while the cabling, drying, impregnating, leading and testing departments were also down on the ground floor in different sections, making it necessary to handle material at a higher cost than would have been the case with a correct plant layout.

While this plant layout seems impractical, there is no reason why the mill should not be able to produce a high grade cable with proper equipment trained, labor and a slight redesign of layout.

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ANOTHER cable plant was laid out as follows:—one building *without partitions* contained all on one floor, the following; on one

side of the room the wire drawing mill; the annealing, stranding and part of the insulating department, the shipping department in the middle of the room and the other parts of the insulating department, together with the cabling, drying, impregnating, leading steel taping and testing departments on the other side of the building.

✦ ✦ ✦

THIS latter plant, with everything on one floor was designed to make material handling easy, and with every operation visible at any point in the building. It was arranged for quantity production, exclusively, but in its operation developed considerable difficulty in producing a satisfactory quality cable. Why—will be seen in the body of this study.

✦ ✦ ✦

The Rod Mill and Cable Failures

MANY cable failures have their origin in the rod mill.

Uniformity of temperature before rolling is highly essential and this means that the inside of the bar must have the same temperature as the outside.

✦ ✦ ✦

CRACKS in the wire very often cause considerable trouble and not only weaken the cable mechanically but also electrically. Such cracks are often due to improper heat treatment of the rod or bar, or in the bar not being turned before EVERY PASS. It is very essential when rolling, to turn the bar 90° before it enters the next pass. Many mills make the mistake of not carrying this turning operation through on EVERY PASS, because of the hard work and skilled labor required, which is not always obtainable. In order to eliminate any uncertainty in this operation it is recommended that automatic feeding and turning devices be installed and thus make certain of the bar being turned before EVERY PASS.

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Air and Moisture

SINCE air and moisture are the principal enemies of the high tension cable one of the greatest problems encountered in the manufacturing process is how to decrease moisture and reduce voids (wrinkles in the paper insulation) to a minimum, or so far as possible to make ineffective their harmful influence on the electric character of the cable.

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CLEANLINESS is another vital consideration. Rooms free from dust, equipment free from carbonized oil or other conductive dust together with plenty of light and dry air are primary factors in successful production.

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TO meet these requirements it is desirable to have separate enclosed rooms for (stranding), for (taping and cabling), for (drying, impregnating and leading), for (armoring), for (testing and for (shipping).

Further, since it is in the taping and cabling operations that voids are largely eliminated, these operations should be closely supervised and cleanliness should be absolutely insisted upon. Of course, voids may be created by cable expansion through heat but even these may be reduced if more care is taken during the taping and cabling process.

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THESE necessary precautions are the reason for my comments on faulty plant layout earlier in this article. It is my opinion that operating departments for plants of this type should all be on one floor so that transportation and handling costs are reduced to a minimum but that each operation should occur in a separate enclosed room for the production of a better quality cable.

✦ ✦ ✦

Elimination of Voids

I DO not think, that there is a cable manufacturer in existence who can safely say—that all the paper cable he is producing is leaving the plant without wrinkles. And this brings up the question—"Is there a *sure* way of producing a three or four conductor paper cable without wrinkles?"

MY opinion is, that, with modern equipment, proper buildings, right air conditions, modern processes, skilled operators and proper supervision, it is possible to eliminate wrinkles entirely, and reduce voids and moisture to a minimum.

To secure this result; it is first of all necessary to choose an insulating material which contains a minimum amount of moisture, combined with the best insulating qualities obtainable, for the reason that a cable containing a minimum amount of moisture at the beginning of the drying and impregnating process has the advantage that the paper fibres are not materially weakened in the fabrication of the cable.

With such a material it depends on the mechanical construction of the cable whether it will remain without voids during the manufacturing operation and when the cable is in use.

In this connection; a discussion of some of the conditions we have to meet and control in the construction of a cable of this type will be of interest.

✦ ✦ ✦

Voids Caused By Paper

A CONDUCTOR insulated with a number of paper layers. This displacement is the greater in the outer layers than in the inner layers. Coming off the capstan and going to the reel the cable is bent back and so the paper layers are supposed to go back to the original position. But, will they go back properly without leaving a wrinkle—a void?

✦ ✦ ✦

THIS procedure is repeated another time, bent around the reel drum—(smaller diameter, greater bend) and perhaps once more when the conductor has to be cut into the required length before cabling. During this taping operation, the paper layers have been displaced in the direction of the middle axis of the conductor.

✦ ✦ ✦

BUT how about the cabling operation where the conditions are far worse because the conductors are bent and twisted at the same time? I have seen cabl-

ing machines in operation, where conductors are forced to make many unnecessary bends and twists, due to the wrong design of the machine.

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IN the last few years a method has been developed where conductors are twisted before the paper is applied. This method eliminates in part the displacement of the paper during cabling. However, in practice, this is very difficult to carry out, although it has been done with success in a few plants.

✦ ✦ ✦

NOW, since we know, that a displacement of the paper layers occurs during the various manufacturing processes and that these displacements are creating wrinkles (voids), a question comes up which has puzzled all cable manufacturers and much money has been spent for research, but with the problem as yet unsolved.

✦ ✦ ✦

1. How Can the Displacement of Paper Layers be Reduced to a Minimum During Manufacture?

IN my opinion improvement in this can be secured:—

1. By twisting the conductor before insulating.

This has to be done with great care, otherwise, it might make considerable trouble in twisting the sector conductor after the insulation is applied; that is, during the cabling process. The twist given before insulating has to correspond with the lay given on the cabling machine. A specially built stranding machine, combining stranding and twisting in one operation is a good way to obtain the twist before insulating.

2. By the installation of a specially built machine, mounted in front of the insulating machine, combining the twisting and taping in one operation.

3. By paying special attention to the stranding operation and the stranding machine itself. Poorly stranded conductors increase the displacement of paper layers, whether the conductors are pretwisted or twisted by cabling. Tension in the wire strand is one of the most important factors of stranding a conductor. The conductor has to be stranded very tight so that, when twisting during cabling the conductor is twisted as a whole (that is, like a solid bar) it will eliminate the displacement of the wire strand and consequently decrease the displacement of the paper layers.

4. By decreasing to a minimum the bending of insulated conductors. This can be accomplished by the use of large pull-off drums (capstans) and large drums on take-up reels.

5. By keeping the single conductors as much as possible in a straight line until all the conductors are cabled and ready for drying and impregnation. This means making a cable without the use of capstan and reels in one operation.

There is no reason to believe that the above cannot be done and this method of production of a three or four conductor cable would eliminate much present faulty construction.

✦ ✦ ✦

2. How Can the Layer Displacement Which Cannot be Avoided, be Rendered Ineffective Against Creating Wrinkles?

PAPER displacement is caused by the moving of one layer of paper on another. Friction is the resistance to this motion and the force of friction depends on the conditions under which the sliding occurs.

(a) This friction between paper layers under known pressure can be increased or decreased by varying the amount of moisture in the paper.

(b) The friction between paper layers with known moisture content can be increased or decreased by varying the pressure.

So we have two methods of decreasing the friction between the paper layers.

1. To decrease the friction by the amount of moisture it is desirable to dry the paper to a certain extent before using and also to perform the taping and cabling operations in separate *dry and clean ROOMS*. (Here I come back to my statement that it is not desirable to have all operating departments in one room because of the difficulty in controlling the air conditions as this should be in the taping and cabling department.

✦ ✦ ✦

THE principal cause of the creation of wrinkles is the *unevenly divided pressure* (friction) between the paper layers.

This can only be prevented by a proper tension in the paper during taping. It is therefore necessary to pay special attention to the tension when the paper is applied.

It is of the greatest importance to have a greater tension in the paper nearer the conductor and a lesser tension in the outer layers. And that the tension should be gradually released.

For instance;—if 42 papers are applied and the *FIRST* paper has a tension of about *20 pounds*, the last paper should then have about 6 pounds tension. The tension in the *SECOND* paper would be;—20 pounds or 320 ounces minus 5.38 equal 314.62 ounces.

The THIRD paper; — 314.62 minus 5.38 equal 209.24 ounces.

The FOURTH paper;—309.24 minus 5.38 equal 303.86 ounces, etc. This would, in my opinion, be the best condition for taping in order to prevent wrinkles. However, since we know that, it is not *possible* to maintain an absolutely uniform tension throughout the operation, we will try to keep very close to uniformity, and this should do the job. Possibly the worst conditions develop when there is more tension, for instance, in the 30th paper, and less tension in the 25th paper. A conductor taped under such a condition will surely create wrinkles in the operations following.

THE type of taping machine and type of tension device used for this work, is therefore, of the greatest importance.

(*Please turn to page 268*)

New Principle Applied in Bright Annealing Copper Wire

By J. B. Nealy
American Gas Association

Gas fired unit in atmosphere of steam specially designed for bright annealing copper wire at plant of Diamond Braiding Mills, Chicago Heights, Illinois, solves difficulties of discolcration and objectionable oxidization. ▼ ▼ ▼ ▼ ▼ ▼ ▼

THE constantly recurring problem of bright annealing copper wire has finally been solved in a most satisfactory manner by the Diamond Braiding mills of Chicago Heights, Ill., by the use of an entirely new principle and gas fuel. A furnace has been designed, built and operated for over two years in which the necessary heat is applied to the work by convection of a heated fluid, steam, which is chemically inert with respect to the product. This furnace has a high thermal efficiency and anneals the product with absolute uniform ductility, free from discoloration and objectionable oxidation. With slight variations in temperature, the ductility of the annealed wire can be made from 25 to 40% softer than the code requirements. The idea was conceived and executed by S. B. Gamble, Industrial Gas Engineer of the Public Service Company of Northern Illinois, and S. M. Berolzheimer, Chief Engineer of the Diamond Braiding Mills.

✦ ✦ ✦

Need for Special Furnace

THE need for this furnace was due to the fact that bright annealed copper wire purchased in the open market, varied so much as to ductility that subsequent processing was uncontrollable. At least this was the experience of this company which manufactures everything that goes into its product under one roof. This concern makes a complete line of the smaller sizes of insulated, flexible, electrical wire and cords of all kinds, heat resisting fixture wire, and asbestos insulated wire also a great variety of stranded and braided copper wire products such as pigtail wire and braided copper for movable switch connections.

✦ ✦ ✦

Trouble Centered in Stranding Process

IT was in the stranding processes that the trouble centered so the management decided to install its own copper wire drawing department. This necessitated the purchase of annealing equipment and a wide search was made by this concern for an annealing furnace which would permit control of ductility within much closer tolerances than that of the wire which they were formerly able to purchase on the open market. After thoroughly investigating all furnaces on the market, it was decided to accept the engineers' special design and build an unique gas heated bright annealing furnace.

✦ ✦ ✦

A FURTHER object of the design of this new furnace was to permit skid loading so that a skid load of spools filled with copper wire could be wheeled into and out of the annealing chamber on a standard lift truck from floor level, thereby eliminating the necessity for cranes, hoists and the like, to-

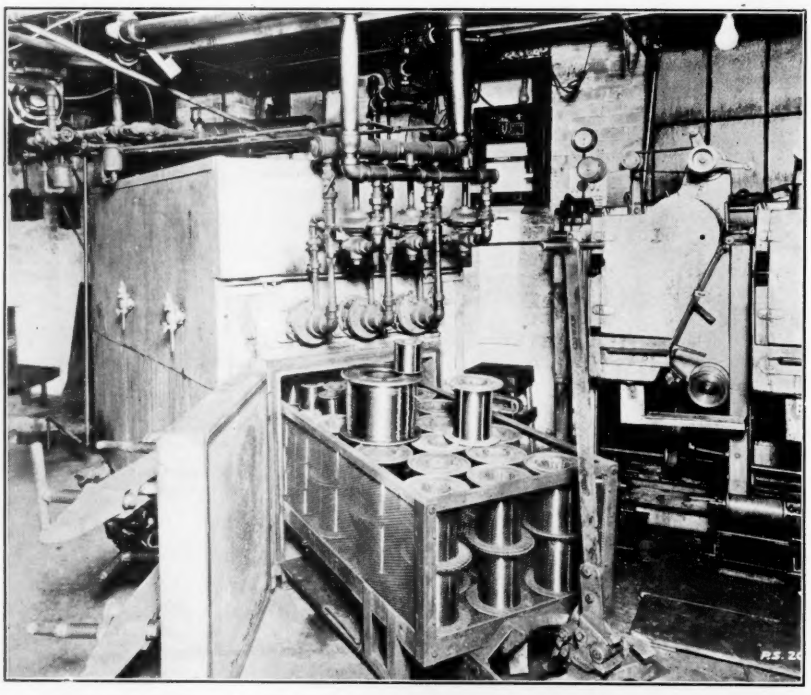

Fig. 1. Front view of annealer showing potentiometer controller in background, also proportional mixing gas burners. (Wire drawing machines at extreme right foreground). Note large and small spools and different size wire in same load. ✦ ✦ ✦ ✦ ✦ ✦ ✦

gether with considerable rehandling incident to the operation of competitive annealing units. Another advantage over other furnaces is that the treated material can be cooled or quenched without the use of a tank or auxiliary cooling chamber. In fact, the material is removed from the furnace as a finished product, quenched, dry, annealed and clean.

✦ ✦ ✦

Construction of Furnace

THE annealing chamber and gas-fired steam superheater, comprising the two most essential parts of this furnace, are built together so as to eliminate pipe connections and to increase the thermal efficiency. The top wall of the annealing chamber constitutes the bottom wall of the superheating chamber. The gas-fired superheater comprises a rectangular flow chamber co-extensive in length and width with the annealing chamber. The rear end wall of the superheater is formed along its upper edge with a rectangular transverse inlet duct which is vertically aligned with the periphery of a power driven exhauster. A number of horizontal baffle plates extend longitudinally through the superheating chamber designing a tortuous passage for the steam. Gas-fired immersion heaters are employed in the superheater. Gas burners of the proportional gas and air mixer type fire into tubular refractory lined combustion chambers, discharging into tortuous heating tubes arranged so that the products of combustion counterflow the superheated steam. The gas is fired "full muffle" and the products of combustion are eventually vented to the atmosphere. The superheater is connected with the annealing chamber through a number of transversely aligned openings in the front end of the top plate of the rectangular annealing chamber. The rear end wall of this annealing chamber is formed with a short duct designing a discharge passage connecting with the intake of the aforementioned exhauster. The periphery of this exhauster connects with a vertical discharge duct into which is connected a horizontal sleeve leading to a weight loaded flap valve discharging to the atmosphere. This vertical duct in alignment with the periphery of the exhauster is further provided with a butterfly valve introduced above the horizontal sleeve which connects with the flap valve. When this butterfly valve is open, steam is recirculated from the annealing chamber under the propulsion of the exhauster and driven through the superheater and back through the annealing chamber. The furnace is heavily lagged with insulation and sheet metal.

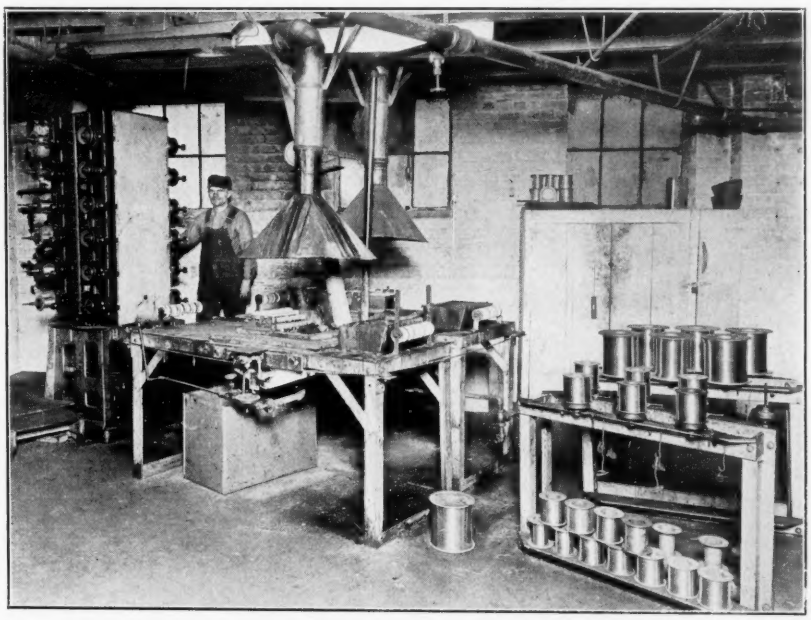

Fig. 2. Gas fired tinning pots in which fine copper wire is tinned continuously and automatically by passing wire through mechanically. Single strand annealed wire on spools, right from the annealing furnace is unwound, tinned, wiped and rewound in a single continuous operation. ✦ ✦

✦ ✦ ✦

Furnace Operation

IN operation this furnace will anneal indiscriminately copper wires of various sizes and weights, on spools of the same size or different sizes, at the same time. Also, the wire is annealed on the same spool on to which it is cold drawn and from which it is later unspooled for stranding. When the furnace is loaded the burners are ignited and the exhaust fan started with the butterfly valve closed so that the steam, drawn from the plant's steam lines, after circulating through the superheater and annealing chamber, respectively, is exhausted to the atmosphere, thus purging the system of air. The butterfly valve is then opened and the steam caused to recirculate through the system, joining with any new steam from the plant's steam lines, and is obviously reheated in the course of its return flow. A small amount of steam does escape past the weight loaded flap valve which acts in the capacity of a weighted pressure relief valve. The pressure within the annealer is only slightly above atmospheric pressure to prevent any possible infiltration of air.

✦ ✦ ✦

THE use of superheated steam as a heating medium and its circulation through the system at a terrifically high velocity makes it possible to maintain high temperatures without entraining a large volume of heat. This affords a sensitive control over a wide range of the rate at which the work is heated. The superheated steam permeates all the interstices of the work due to the high velocity, thus resulting in obtaining substantially the same tempera-

ture throughout the entire mass in the furnace.

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Pyrometric Control

THE temperature is caused to rise gradually to the desired point (525 degrees Fahrenheit) under automatic pyrometric control. After the product is annealed, sans any soaking period, the gas burners are extinguished and water is injected into the steam passage, thus cooling the chamber and quenching the work with the latent heat of vaporization of the water introduced with the steam. Thus the product is quenched within the furnace without the use of a tank and is then removed in a clean dry state. In general, the product—copper wire—is clean, dry, uniformly soft and ductile, free from water discoloration and oxidation and has a bright finish. Copper will oxidize in air at temperatures down to 160 degrees Fahrenheit and even slowly at room temperatures. If unusual requirements necessitate such, the system may be operated under vacuum until the product is cooled below 160 degrees Fahrenheit. The thermal efficiency of the furnace is high, the heat penetrates uniformly to all parts of the product and is readily controlled, and the operation is carried out with a minimum handling of the product.

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Comparison of Types

THE closest competitor was an electric furnace, inverted over a pool of water that served as a seal to the furnace. Heat was supplied through radiant elements disposed about the inside wall of the furnace and a weighted flap valve at the top was provided to vent the excess steam generated by the heat in surface contact with the water. This furnace operated at a temperature upwards of 900 degrees Fahrenheit, which was nearly twice the required temperature of 525 degrees Fahrenheit. The manufacturers of this furnace later substituted another design—the hermetically sealed, retort type of furnace.

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THE idea back of this new type was to enclose a few spools of copper wire in a silver soldered copper retort which is scavenged of air and sealed after filling with an inert gas such as hydrogen, specially treated city gas, products of combustion of city gas, combinations of nitrogen and hydrogen and others. This retort is then introduced into a radiant heat furnace and the whole brought up to annealing temperature, after which it is removed and allowed to cool to approximately room temperature. The copper wire is then removed, supposedly bright and soft. This type of furnace is costly, its use necessitates extensive handling, occupies a large amount of valuable floor space, is uneconomical of fuel and does not lend itself to accurate temperature control within the interstices of the spooled wire.

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THE transmission of heat in this hermetically sealed retort type of furnace is very largely by

(*Please turn to page 270*)

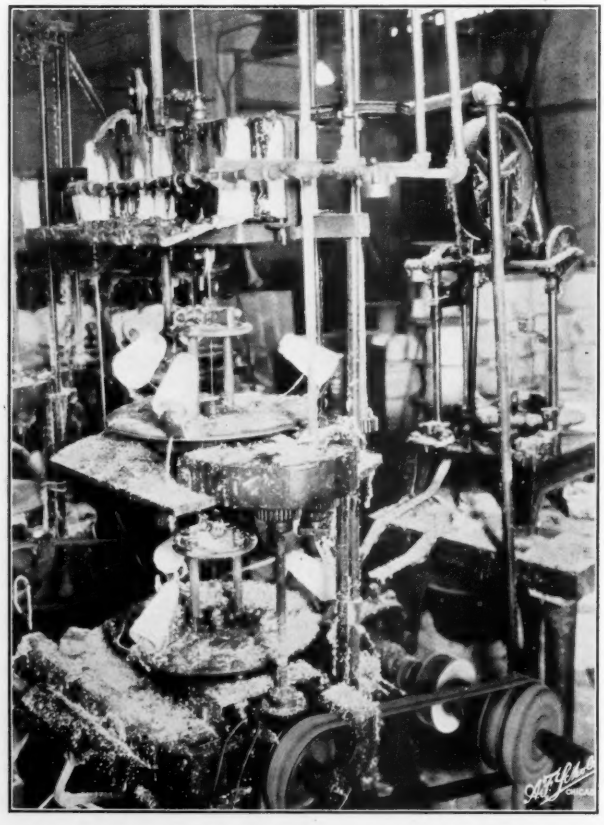

Fig. 3. Gas fired, immersion coil heated, impregnating tank for asbestos covered fixture wire. ✦ ✦ ✦ ✦ ✦ ✦

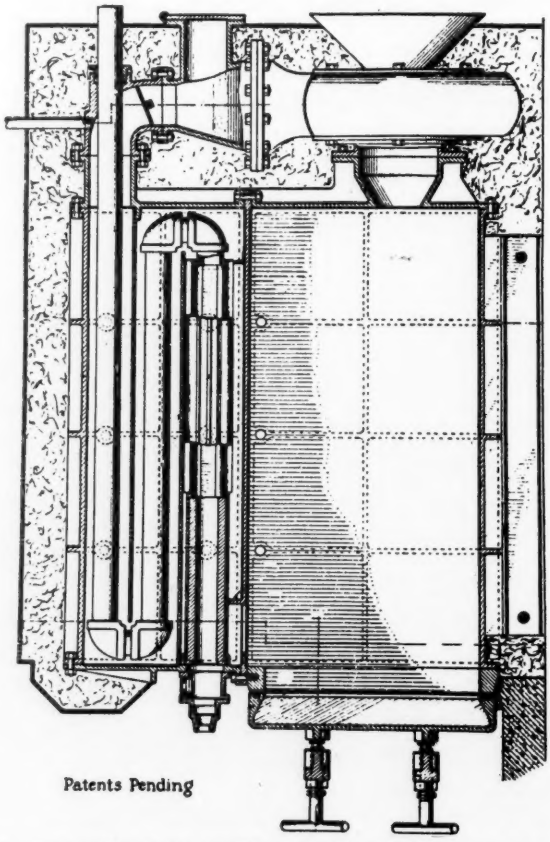

Fig. 4. Cross section of side elevation of annealer showing steam superheater, annealing chamber, circulating fan, etc. ✦ ✦ ✦

Improved Continuity Test for Enamel Insulation of Wires

By C. R. Moore
Bell Telephone Laboratories, Inc., New York, N. Y.

An improved method of testing enamel insulation and a comparison with the standard mercury bath test. ▼ ▼ ▼ ▼ ▼ ▼

SOME twenty billion feet of enameled wire is used annually by the Bell System. In the smaller sizes large quantities of it are used for winding numerous pieces of apparatus such as relays, ringers, transformers, and retardation and repeating coils. For this purpose enamel is considerably cheaper than textiles and takes up much less space. The reduction in space secured is particularly important with the smaller sizes of wire so that for certain windings, such as transformers, enamel insulation is practically indispensable. It is applied by passing bare wire through a varnish solution and then through an oven to bake it on. The process is repeated until an insulating coat of the desired thickness—ranging from a few ten thousandths of an inch for the smaller sizes to a few thousandths for the larger—has been built up on the wire.

ANY discontinuity in the enamel coating is, of course, a potential source of trouble. Should two breaks in the insulation be in contact in a coil, one or more turns would be short-circuited. To test for continuity of the film it has been customary to pass the wire through a mercury bath with a potential maintained between the mercury and the wire so that any defects may be detected electrically. A relay and message register serve to record the number of defects in a given length of wire.

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THESE defects have commonly been believed to be small holes, some of them perhaps microscopic, in the enamel coating. It has been realized, however, that perhaps some of the defects were minute irregularities in the copper wire which projected through the thin insulating film. It has also been thought that perhaps certain small projections might not quite pierce the film but that under the pressure of a wound coil they would break through and give trouble. With a mercury bath it is impossible to distinguish between the first two types of defects, and projections not quite through the surface would not be detected at all.

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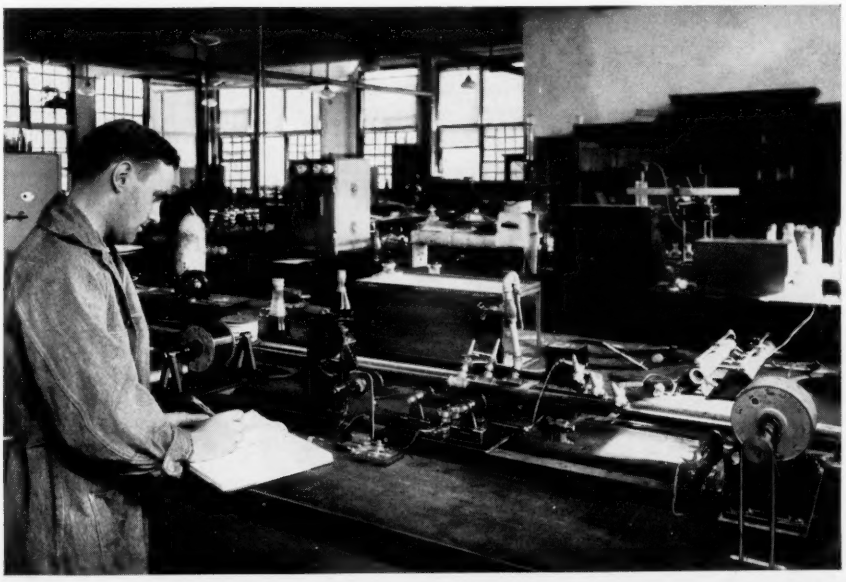
MICROSCOPIC examination shows that such projections undoubtedly exist and that they may be fins running lengthwise along the wire, small slivers of metal projecting out from one point, or particles of copper detached from the wire and suspended in the enameling bath. The



latter, even if not originally in contact with the wire, may be forced into contact by the winding pressure. To gauge the relative number of slivers or fins, and pinholes, is practically impossible by visual examination through a miscoscope because of the extremely small number of them in any reasonable length of wire. Work was therefore started on a new laboratory testing method which would detect metal projections.

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AS finally developed for laboratory use the new testing machine is shown in the photograph at the head of this article. At the extreme left is the supply spool of wire to be tested. From it the wire passes over a wheel for measuring its length, and then under an idler pulley which is weighted to maintain a uniform tension on the wire. It then passes through the testing apparatus and from that over a spacing pulley and onto the take-up spool at the extreme right. The testing apparatus consists of two ball bearings mounted on vertical posts of hard rubber, and two guiding wheels—one on each side of the two rollers. The front roller is fixed while the other is attached to a movable lever. Weights, suspended beneath the table, act on this lever to establish a pressure between the rolls, which may be adjusted as desired.

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THE rollers and the wire under test form part of an electrical circuit which counts the defects found. The arrangement of the equipment is shown schematically in Figure 1. It resembles that used with the mercury bath in employing a message register for counting the defects, but differs in using a grid-controlled discharge tube, suggested by D. S. Bond. This permits much higher speeds of the wire since a very brief electrical impulse through the defect will start a discharge of the tube which will continue until the message register has operated—at perhaps quite a considerable interval after the defect has passed beyond the rollers. Operation of the register actuates a relay which opens the discharge circuit of the tube and reinstates the circuit in its normal condition ready for another impulse.

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Although the rollers make contact with only two sides of the wire, the number of defects found will be proportional to the total number over any appreciable length of wire. By adjusting the pressure between the rolls it is also possible to discover some potential defects, developed by the winding pressure, which would not be detected in a mercury bath.

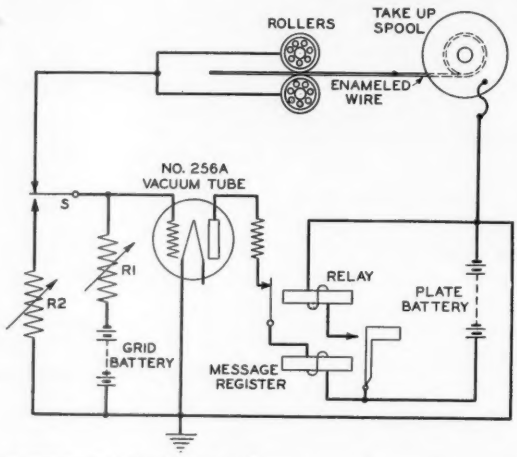

Fig. 1. Schematic arrangement of the testing equipment.

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SENSITIVITY, or the amount of resistance at the defect through which the equipment will operate, is controlled through the grid biasing resistance R1. For adjusting, the switch S is moved into contact with R2 which is set at the desired contact resistance. R1 is then moved until the tube discharges. With this setting of R1, S is moved back to contact with the rollers, when the test may proceed. Curves showing typical results are given in Figure 2. The specimen of the upper graph had a comparatively large number of defects while that in the lower had very few.

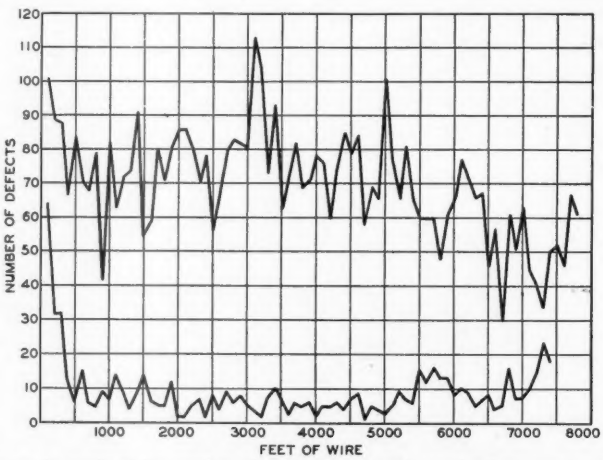

Fig. 2. Plots can be made of the number of defects found; and samples from various sources differ widely.

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ANOTHER advantage of the new equipment is that it does not damage the wire run through it, which—after the test—may be used for the production of coils or other products. Mercury, with the former method, would adhere to the wire and make it unfit for further use. The new method has been thoroughly tested and is expected to prove valuable in further Laboratory studies.

Wire Galvanizing Processes

By W. H. Spowers, Jr.,
Consulting Galvanizing Engineer, New York, N. Y.

An analysis of the discussion on
HOT GALVANIZING VS. ELECTRO GALVANIZING
between Mr. L. D. Whitehead of Whitehead, Hill & Co., Ltd.
and Mr. G. K. Rylands of Rylands Brothers, Ltd.

A Review of the Controversy on the Respective Merits of Hot Galvanizing versus Electro-Galvanizing and an analysis of the relative advantages and disadvantages brought out in the discussion. ▼ ▼ ▼ ▼ ▼

IN reviewing the papers relating to this debate, I have taken the liberty to correspond with my friend, Mr. Luis E. Eckelmann, who is well known for his very valuable work in the electroplating field and I shall quote him freely in this discussion when occasion demands. In doing so, it will be at all times my desire to give to each of these processes credit where credit is due and to avoid any shading except where the facts warrant.

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IN digesting this review I suggest that the reader have at hand the various installments so that easy reference may be made.

In the first place if we are to have a fair discussion our premises must be sound, and I must quote Mr. Whitehead (Pg. 223) "In galvanizing, the value of the coating as a preventative of corrosion, is directly dependent on the degree of purity of the zinc coat, etc." I take it he refers here to any iron content in the coating and he bases his whole argument on this statement as a fact. It is not by any means an established fact that the iron zinc alloy layers in galvanizing are less resistant to atmospheric corrosion than the pure zinc layer.

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I have never been successful in establishing either in my own laboratories or those of my clients data that would allow me to make such a definite statement as this. Some very extensive work on this determination was completed at the Bell Telephone Laboratories in New York with the definite conclusion resulting that "no differences are found in the rate of loss between the zinc and zinc alloy layers of hot dipped coatings". These tests were run under actual weather conditions in New York.

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AGAIN on the same page Mr. Whitehead says "Zinc in its pure state serves its purpose as one of the best protective agents, but it loses a great deal of its value in this respect when alloyed with iron (if only to a slight extent)". Here we have the same premises set up as a fact and to which my foregoing remarks may be equally well applied. Please bear in mind that I am not saying that Mr. Whitehead is wrong in this, I am merely saying that he sets up as a fact a situation which has not been determined to be a fact. My position in this matter is confirmed by Mr. Eckelmann.

W. H. SPOWERS, JR.
Consulting Galvanizing Engineer
Member Wire Association

I think, then, that we must read with question any argument by Mr. Whitehead which depends for its substantiation on this belief as a fact.

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AGAIN on Page 224 Mr. Whitehead speaks of the very brittle nature of the zinc in alloy layers in galvanizing. This is very true—the interlining alloy layers lying next the base metal in any old-fashioned galvanizing process are brittle but I think Mr. Whitehead must be unaware of the developments in this field of the last few years if he retains any apprehension on this score. Does he not know of the methods used to anneal these inner layers so that any weight coat may be bent around its own diameter and unbent repeatedly until the wire itself breaks without any semblance of a crack let alone flaking?

Is Mr. Whitehead uninformed regarding the very superior coatings obtained by the use of modern deep fired kettles and the very great savings in costs and uniformity of coat obtained by the adoption of this modern technique?

I received a letter just the other day from one of my clients in Canada which read in part as follows "The Hydro-Electric Commission Engineers are very discriminating buyers, have developed a rather rigid specification and have been attracted by the good work we are doing—so made our product their choice". These people have forgotten the old cracking, flaking days of wire galvanizing.

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MR. Whitehead is also I take it unaware of the recent demon-

strations made for the trade here under my patent applications for continuous wire galvanizing. This process now being installed in one of the largest wire plants here will eliminate the use of the old lead pan, it will eliminate the use of acids for cleaning and fluxing, it will make unnecessary the introduction of heat directly into the galvanizing kettle. These changes effect a saving in the process of over a dollar a ton and provide with ease a process of perfect controlability and constancy of technique with a resulting uniformity of product never before equalled.

I speak of these developments in the galvanizing field because I fear most of Mr. Whitehead's arguments against the hot process are based on old fashioned technique, long since discarded by progressive manufacturers and which hold no proper place in a comparative discussion of this sort.

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IN all of this discussion a lot of comparative data has been placed in evidence but nothing in all of it which is essentially new. After all, the reading of microphotographs, in this instance at any rate, is far from a positive art. If these samples were sent to me, for instance, for a microscopic opinion, my thought on the matter would be based entirely on comparison with other microphotographs taken by me in like manner. I once cut a sample of wire in four sections and sent these four samples to four different men with the request that they photograph them, specifying at the time only the diameter. The four pictures returned were not recognizable as the same piece of wire.

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THAT there is an inclusion of a non-metallic substance in the strata in electro-plated wire seems to be evident and in this Mr. Eckelmann agrees. I am inclined to agree that the result of tests made by the spectroscope (Page 50) will not differentiate between, let us say, zinc oxide and metallic zinc. But why object to this? We all know that an oxide film on the outside of zinc coatings acts as a detriment to atmospheric corrosion. If this be so, then such a condition within the coat may very well have an assisting effect so far as the resistance of the coat to corrosion is concerned. If I were Mr. Whitehead I think I would not object to this, in fact, if this reasoning is correct, why not welcome it?

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ON the other hand we know that zinc is electro-positive to iron and this is the fundamental reason for its value as a protecting coat. The zinc corrodes at the expense of the iron, if this were not so, it would not be of value as a protective. It is the weight of coat (thickness) which counts, for when the zinc is gone there is no protection. This holds with both processes. It is not an established fact that zinc iron layers are less protective than pure. It is certain, however, that copper sulphate will attack pure zinc more rapidly than zinc iron alloys and therein lies danger of the Preese test as anything but a comparative test.

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INASMUCH as a great deal of data has been accumulated in these papers and the conclusions deduced therefrom are based to a large extent on these tests, we should, I think give some definite thought as to what in the last analysis is the real value of an accelerated test of any description.

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IN the first place we know then that the value of zinc as a protective to iron is because of the fact that zinc is electro-positive to iron and corrodes itself although very slightly and slowly at the expense of the iron and this corrosion is progressive until the zinc coating has entirely disappeared. Therefore, the conclusion seems correct that the thicker or heavier the coat the longer will be the protection. We know also that copper sulphate as used in the Preese test attacks pure zinc very much more rapidly than it does the zinc iron alloy structures in the coat. Given then two coatings of equal thickness the one having a wider zinc iron alloy structure will resist copper sulphate to a greater extent than the one made up in greater proportion of pure zinc. Therefore the copper sulphate test cannot determine the thickness of a hot galvanized coating. It can be of value therefore only for determining the uniformity of the coat.

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THE determinations made by dissolving the coating in acids by Mr. Rylands must also be inaccurate. The gases do not stop and start to the time of a stop watch and exactly when the stripping has been completed is anybody's guess. The only accelerated test then which can be counted on for determining the value of zinc coatings as a protective is the weight of coat test which should be figured in ounces per square foot of surface covered. The procedure in this test should be as follows:—A given length of coated wire should be accurately weighed, the coating then stripped from the sample by the use of muriatic or sulphuric acid, and the bare wire again accurately weighed and the difference reduced to ounces per square foot of surface covered. We have then an accurate determination of the weight of coating. The life of this coating can be determined only under specific atmospheric corrosion tests.

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I SUBMIT then that the arguments which have been given anent the merit of these two processes have been based upon various tests which in themselves are open to question and I suggest that these two gentlemen each give birth to their favorite plant child and gird themselves for the battle of the Mesa where they may determine by actual atmospheric conditions the merits of their respective offspring.

I think more consideration should have been given in this discussion to the commercial aspects of these two processes. We all know that in any involved technique of this kind the human element plays such a large part as to, in many cases, result in good or poor work according to the ability of the individual in charge of the operation, and to this human element variation, may be attributed I believe, the lack of uniformity in the samples used in the tests given.

(*Please turn to page 273*)

A Review of Recent Wire Patents

No. 1,861,450, TIE WIRE, Patented June 7, 1932, by Ned A. Ochiltree of Peoria, Illinois, assignor to Concrete Engineering Company of Omaha, Nebraska, a Corporation of Nebraska.

The tire wire comprises a length of wire somewhat sickle-shaped prior to bending about the fence post, the terminal portions of the tie wire being adapted to engage the rib portion of the fence post when the device is applied.

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No. 1,861,851, SUBMARINE SIGNALING CABLE, Patented June 7, 1932, by John J. Gilbert of Port Washington, New York, assignor to Western Electric Company, Incorporated of New York, a Corporation of New York.

According to the present invention it is proposed to provide a cable which will have at high frequency a low effective resistance and a high inductance. This is done by dispensing with the loading material in the core and removing the conducting tape from the region adjacent the core to one more remote, and preferably to that of the armor wires. Further, it is preferred to employ for the core conductor a wire which is strainted to a degree sufficient to keep the increment in resistance due to "skin effect" to a low value, and to utilize for the return circuit a ring of wires or tape having high conductivity for the return current, which may either take the place of the usual ring or steel armor wire to be located within the latter ring sufficiently far from the core to insure that the inductance obtained is helpful.

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No. 1,862,199, REEL, Patented June 7, 1932, by Edward H. Schane of Lakewood, Ohio.

This reel is particularly adapted to receive plain or barbed wire wound upon the same in shipment from the mill to the dealer or consumer. The reel itself is constructed wholly of bent wire, forming two end or head members, while additional members form the barrel and a pair of loops to form eyes for the reception of a mandrel or shaft upon which the reel may be mounted.

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No. 1,862,333, MULTIPLE WINDING DEVICE, Patented June 7, 1932, by Albert H. Cole of Chicago, Illinois, assignor by mesne assignments to The Muter Company of Chicago, Illinois, a Corporation of Illinois.

The invention relates to multiple winding devices, particularly for the purpose of simultaneously applying double resistance wires to a substantially flat base and it is an object of the invention to provide means whereby either one or a plurality of windings, of length up to nine inches, may be wound on a single base of any desired length up to the length of the lathe bed itself, so as to increase the efficiency of the machine.

✦ ✦ ✦

No. 1,863,048, METHOD OF JOINING WIRES, Patented June 14, 1932 by Walter S. Hayford of Morristown, New Jersey, assignor to Bell Telephone Laboratories, Incorporated, of New York, N. Y., a Corporation of New York.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 551 Fifth Avenue, New York.

The inventor provides a metal sleeve softer than the wires to be joined and then rolls the metal sleeve from one end to the other, thus driving out moisture or gases between the sleeve and the wire and forming a joint.

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No. 1,863,064, ATTACHMENT FOR MACHINE FOR COILING METAL, Patented June 14, 1932 by Michel Nigro, of Worcester, Massachusetts, assignor to Sleeper & Hartley, Inc., of Worcester, Massachusetts, a Corporation of Massachusetts.

The attachment is provided for machines for coiling metal, such as spring-making machines, or machines for making lock washers by the severance, at intervals, of metal strip coiled into helical form. The inventor is particularly concerned with the provision of a preliminary deflector for the wire or other stock, so designed and so disposed with respect to the coiling devices that when the advancing end of a piece of stock encounters the deflector, the stock will be readily deflected for formation into a helix, without interrupting the continuous operation of the machine. When this preliminary deflection of the stock is accomplished, the deflector becomes inoperative during the normal coiling of the stock into the helical form.

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No. 1,863,147, INSULATED ELECTRIC CONDUCTOR, Patented June 14, 1932 by James Howard Young of Pittsburgh, Pennsylvania, assignor to H. H. Robertson Company of Pittsburgh, Pennsylvania, a Corporation of Pennsylvania.

The inventor aims to provide a substantially odorless, light-colored, and flame-resisting and waterproof wire or conductor, the assembly including in addition to the wire core, an enveloping tube of insulating material, a braided fibrous covering on the insulated tube and a coating of chlorinated diphenyl on the braided covering.

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No. 1,863,169, ARMORED CABLE, Patented June 14, 1932 by Edwin J. Schneider of Jamaica, New York.

The invention relates to an improved protective covering for the insulated wire conductors, the object of the invention being to provide in conjunction with the innerstrip or the sheath formed thereby, a strand arranged within the folds of the strip, forming the sheath and being composed of cotton or the like and serving to form a spiral ridge on the first sheath, in connection with which the outer sheath operates to frictionally retain the other sheath in predetermined position on the conductors. The inventor treats the insulating material about each of the wire conductors with a lubricant so that the two insulated wire conductors may move to conform to the contour of the cable when the latter is spent.

✦ ✦ ✦

No. 1,863,570, MACHINE FOR CUTTING THREADS AND CUTTING TEETH IN BODIES, Patented June 21, 1932, by Ernest J. Lees of Cleveland, Ohio, assignor to The Lees-Bradner Company of Cleveland, Ohio, a Corporation of Ohio.

The machine is provided both for cutting or milling the teeth of cutters, dies, etc., as well as cutting threads upon bodies, the surfaces to be threaded of which are tapered or of conical shape, such as plugs, bushings and the like. Especially, means are provided for guiding and controlling the tool which is adaptable to cutting tapered plugs and the like.

✦ ✦ ✦

No. 1,863,671, CABLE-LAYING APPARATUS, Patented June 21, 1932 by Frederick B. Pitts of Oklahoma City, Oklahoma and Marshall T. Garlinger of East Orange, and Temple C. Smith of Westfield, New Jersey, assignors to American Telephone and Telegraph Company, a Corporation of New York.

This device is particularly adapted for laying underground telephone or telegraph cable, the latter being automatically fed into the trench and the spoil pile of earth is back-filled to cover the cable and fill the trench.

✦ ✦ ✦

No. 1,863,916, WIRE SPRING MAKING MACHINE, Patented June 21, 1932 by Corban H. Ziler of Detroit, Michigan, assignor to L. A. Young Spring & Wire Corporation, of Detroit, Michigan.

Adapted particularly for making hour glass type of springs, the machine knots both ends of the spring so that a complete spring is formed at each operation.

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No. 1,864,032, WIRE COILING AND FORMING MACHINE, Patented June 21, 1932 by Leavitt A. Shertzer of Massillon, Ohio, assignor to The Eaton Manufacturing Company of Cleveland, Ohio, a Corporation of Ohio.

More particularly, this invention relates to machines for automatically forming lock washers and the like, the washers having a plurality of convolutions and provided with an offset or reverse bend therein.

✦ ✦ ✦

No. 1,864,162, CORDAGE MACHINE, Patented June 21, 1932 by Frank Zettek of Chicago, Illinois, assignor to Kellog Switch-Board and Supply Company of Chicago, Illinois, a Corporation of Illinois.

This invention relates to the wire twisting mechanism of wire stranding machines, the inventor providing a rotary wire guide secured to the supporting frame of the machine by means of a ball bearing and serving as a receptacle for the mouth piece into which the wires are fed.

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Winco PRODUCTS XXXX Enameled Wire has been developed to replace single silk covered and single silk over enameled wire in the winding of small motor armatures, fans, high frequency radio transformer coils and other apparatus where high insulation values and ability to resist abrasion, are prime factors.

▲ ▲ ▲

Winco PRODUCTS XXXX Enameled Wire is covered to the same dimensions as the fabric covered wires, and can therefore be wound without changes in armature slots, bobbins or winding jigs.

▲ ▲ ▲

Is superior in its ability to withstand high temperatures.

▲ ▲ ▲

Will withstand softening in the varnish dipping and baking operations.

▲ ▲ ▲

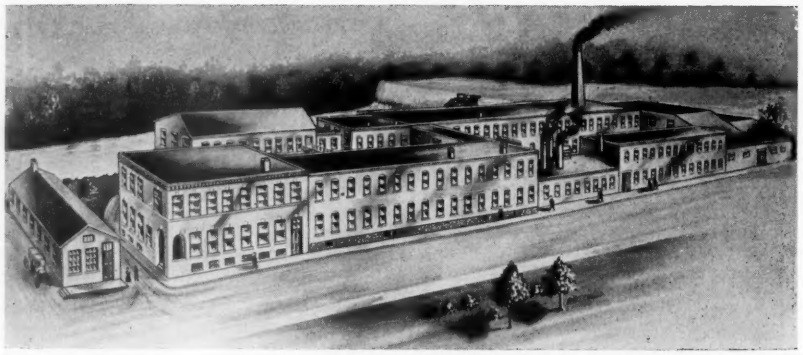
Requires little or no change in winding practice.

▲ ▲ ▲

Costs substantially less than the silk covered wire.

▲ ▲ ▲

Write for samples.



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AERIAL VIEW OF PLANT OF HUDSON WIRE CO., OSSINING, N. Y. ▲ ▲ ▲
▼ ▼ ▼ FINE WIRE MANUFACTURERS ▼ ▼ ▼

"HUDCO" High Conductivity Electric Wire

OTHER FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Cadmium, 10%, 18% and 30% Nickel Silver, Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification.

BRUSH WIRES, CRIMP and STRAIGHT

Brass, Steel, Nickel Silver, Copper and Phosphor Bronze

TINSEL LAHNS

Silver Plated Copper, False Gold and Copper

METALLIC FIBRE FOR PACKING PURPOSES

Copper, Bronze, Zinc, Lead and Aluminum

WIRES FOR METAL SPRAYING

Zinc, Tin, Lead, Cadmium, Copper, Bronzes, Nickel Silver, Aluminum and other wires to specification.

ROLLED FLAT WIRE WITH ROUND EDGES

Copper, Brass, Nickel Silver, Zinc, Lead, Phosphor Bronze and other wires to specification.

"Hudco" copper wire is drawn by the Hudson Wire Company of Ossining, N. Y., who have been specialists in the manufacture of fine wires for over thirty years. ▲

The best grade of copper drawing stock is used, insuring the maximum conductivity. ▲ ▲ ▲

A new process of drawing and annealing is used which produces a wire unusually smooth, clean and uniform in color for enameling and other purposes. ▲ ▲ ▲

Painstaking care in the selection and maintenance of dies guarantees a product accurate to gauge and resistance. ▲ ▲ ▲

You can rely on "Hudco" wire always. ▲ ▲ ▲

Expert annealing of the wire prevents unnecessary breakage when winding the wire into coils ▲ ▲ ▲

If you, too, have a specific problem demanding wire of exact requirements, write to us about it. ▲ ▲ ▲

It costs nothing and involves you in nothing. ▲ ▲ ▲

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HUDSON WIRE COMPANY

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Estab. 1902 — Successors ROYLE & AKIN — Estab. 1902

"HUDCO"
FINE WIRES

'Round the World With the Wire Industry

Wire Nail Factories in Mexico

THE three wire nail factories in Monterrey, Mexico, have experienced the effects of the economic depression with production in 1931 averaging only about 120 tons a month, as against 225 tons in 1930. Normal production is about 300 tons a month and capacity is 400 tons. It is expected that the 1932 activity will show a still further decline—one factory now being closed. The wire used in making wire nails is obtained mainly from local iron and steel works.

✦ ✦ ✦

British to Refine Copper

A NOTEWORTHY development in the British cable industry is the establishment of an undertaking, closely associated with British Insulated Cables, Ltd., under the title of British Copper Refiners, Ltd. The enterprise will remove the reproach that the United Kingdom is behindhand in its facilities for the complete treatment of copper from the raw state to the finished article. The company has been formed with a capital of £120,000 ($600,000), and will produce high-conductivity copper for electrical wire manufacture. This refinery will be the first works of its kind in the country.

The raw material to be delivered to the works will be in the form of blister copper, and the finished products will include copper bars, billets, cakes and slabs of exceptional purity. These in turn will form the raw material for the manufacture of underground and overhead cables, winding wires, and other conductors for electrical purposes. Production has already been made on a sufficient scale to show that electrical conductivity as high as 101-102 per cent of the standard may be expected. The works will be located at Prescot, Lancashire, close to the British Insulated Cable works. The initial maximum output of the plant, which will be of the most modern type, will be 1,125 tons per week, but provision will be made whereby extensions can be carried out. It is expected that the plant will be in operation toward the end of the year. Raw material will be imported from Rhodesia, and the company's production, therefore, will satisfy the demand of those industrialists who now demand all-Empire products.

British Insulated Cables, Ltd., has been generally congratulated on looking forward beyond the present crisis and taking the bold step of inaugurating an industry entirely new to the United Kingdom.

✦ ✦ ✦

British Wire Firm Betters Production in 1931

AT least one big British wire concern was able to break all its production records last year in spite of the severe depression, the directors of Ward & Goldstone reporting that "the output of manufactures exceeded all records."

The enterprise shows a net profit of £9,938 ($49,690) for the year to March 31 last, as compared with £10,726 ($53,630). The usual dividend of 7 per cent is being paid, leaving the carry-forward £2,400 higher at £18,536 ($92,680).

Towards the end of the financial year important building and plant extensions were undertaken. It is anticipated that the benefit of the capital outlay incurred will be reflected in the setting up of another new production record this year.

✦ ✦ ✦

German Notes

THE wire machinery export business is still comparatively satisfactory. The German machinery industry has recently booked some interesting orders from Italy, Russia, Latin America and India, principally for wire drawing units and a few orders for wire nail machinery.

The German makers complain that the Russians are copying the machinery bought and some works refuse to sell further machinery to Russia.

✦ ✦ ✦

THE German export trade is finding that the world market demand for hard drawn wire mesh (mosquito mesh) is changing in favour of soft woven mesh. In the past 10 years the hard enamelled mesh (American quality) replaced the Thuringian type of woven mesh (soft quality) and many German works had transformed their production to the hard quality. Apparently this has now changed and buyers are returning to the soft mesh. This is specially pronounced in Asia and Africa.

✦ ✦ ✦

THE present export trade in wire nails with the United States has radically changed. Very few building trade nails (big nails) are shipped anymore, last year these formed the bulk of the orders, but the majority are now fruit case nails and other packing nails of small sizes.

✦ ✦ ✦

GERMAN wire exporters are demanding from the IWECO, that the policy of fixed export prices for wire and wire products be abandoned. The IWECO is quoting the same prices for every market, only varying according to the freight, port dues, etc. For example the same price is quoted for export to New York as to San Francisco, the same price for export to Great Britain as to East Africa, etc. Now, the exporters say, that the prices could be quoted much higher for certain markets and should be lower for others according to the different conditions. For example, wire nails offered to New York buyers at the present prices are only some ¾% cheaper than the local American prices and this is not tempting enough for American buyers; whereas in Los Angeles the prices are up to 25% cheaper than the American quota-

'Round the World With the Wire Industry

tions. If therefore, the prices in New York would be reduced by 5/10% and adequately advanced in Los Angeles, this would not interfere with the export business to California but would bring additional business from New York. Now that Great Britain has import duties, prices should be lowered and the loss there should be regained by higher prices to such markets where there is local industry. It is probable that the IWECO will adopt this system, although it is said that in this case it will be very difficult to exercise control over the quotations of the members and price-cutting may be resumed.

✦ ✦ ✦

IN spite of all efforts the IWECO has not yet been able to stop the price cutting in wire netting on the export market, although the demand is comparatively good. In this month (July) wire netting had been actually sold at 90% discount off the British standard list (hexagonal wire netting). This is about the lowest price ever quoted. The British wire netting industry has not yet been able to profit from the departure from the gold standard and has as yet not regained any of its lost markets.

✦ ✦ ✦

WOOD screws made of monel metal are a new export article, for while the Far Eastern markets are buyers, in spite of the circumstance, that the price for these wood screws which sell at 27½% off the brass wood screw list (British standard list) are high.

✦ ✦ ✦

THE recent agreement established between the British wire nail industry and the Continental industry concerning prices for wire nails and staples for export to Great Britain as well as the prices of wire for wire nail manufacturing will probably be extended to barbed wire and wire netting. Negotiations between the British wire netting manufacturer's association and the IWECO have already taken place.

Rod Prices

ALTHOUGH the last assembly of the continental wire rod cartel has left all prices unaltered, prices for certain markets, especially South America and the Near East are lower from 3 to 5%. The last quotations for the American market are still valid.

✦ ✦ ✦

Wire Rope Specifications

NEW specifications have been issued for wire ropeways in Germany and Austria, by which the proprietors are compelled to replace the wire ropes every third year for ropeways with a length greater than 1 kilometer and every fourth year for the minor ropeways.

✦ ✦ ✦

Iweco Production

THE members of the IWECO are operating at present at the following rate of their capacity: Belgian wire nails 65%; all other wire and wire products 58%. France, wire nails 71%; all others 60% Holland, wire nails 40%; all others 45%. Germany, wire nails 48% all others 40%. Czecho-Slovakia, wire nails 35%; all others 45%. This is comparatively good, as compared with other departments of the steel industry.

✦ ✦ ✦

Russia Buys Polish Wire Nails

THE reports are now confirmed that of the total quantity of 6,000 tons of wire and wire nails which the Russians placed in Poland, nearly 2,000 tons of barbed wire and nails will be shipped directly from Poland to Vladivostok (Siberia). The barbed wire was bought at a price of £ (gold) 8.12,6 per ton net fob Danzig, which is the same price as quoted by the IWECO, but the Polish industry is also paying the interest for the financing in installments spread over 21 months.

Iweco Changes Price Policy

THE IWECO has given up the policy of fixed prices for wire products. When the IWECO was established several months ago prices were fixed uniformly for all continental wire products and for all markets. This system has not worked well, as competition is different in all markets. Therefore the IWECO has decided to sell in future wire and wire products at prices which will be determined for each order according to the size of the order, the shipment time, the country of the buyer, the state of competition, etc. This means naturally that prices will be lowered and this will be the case especially in such markets, where the continental industry has to meet the British and American competition. The IWECO prices which has been recently published are therefore purely nominal.

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Japan Buying Wire

JAPAN, which for so many months was not buying wire rods is now again in the market, mainly for thick wire rods of 5/16"-3/8" all in mild steel quality. Rather fair inquiries are in the market and it is hoped that some substantial orders will be booked. The present price is $26.25 per ton cif Yokohama /Kobe.

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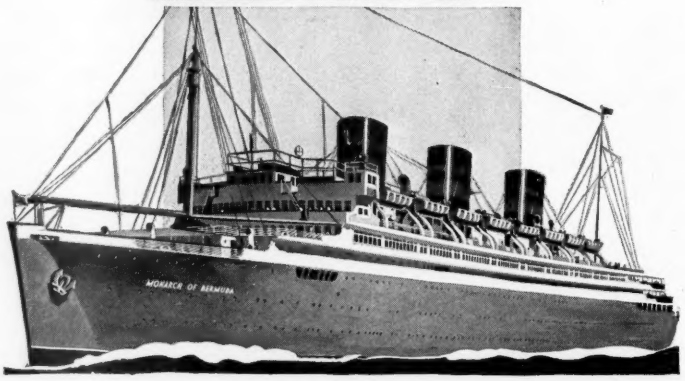
Will the 1933 Convention of the Wire Association be held on ship-board enroute to Bermuda and return?



If so, the meeting room facilities of the 1933 Convention will be unsurpassed. They will include:

(1) Spacious halls on shipboard both for general sessions and for as many as three sectional sessions meeting simultaneously.

(2) Breeze-swept convention halls on land in Bermuda.

(3) Complete auxiliary convention equipment both ashore and afloat—lantern slide projectors, motion picture machines, blackboards, loud speaker systems.

(4) Adequate office space both ashore and afloat for the convention management and its secretarial staff.

A 1933 BERMUDA CONVENTION OF THE WIRE ASSOCIATION WILL BUILD INTERNATIONAL GOOD-WILL!

AMERICAN INSTITUTE OF INTERNATIONAL RELATIONS

1350 BROADWAY, N. Y. C.

Exports and Imports of Wire

Exports of iron and steel wire products in April, 1932 and May, 1932
(In gross tons)

	May 1932	April 1932	May 1931
Wire rods	1,048	1,178	4,532
Hoops, bands, and strip steel	2,208	1,743	3,066
Plain black or galvanized iron or steel wire	696	1,117	1,181
Barbed-wire and woven-wire fencing	1,732	2,293	3,028
Woven-wire screen cloth	67	68	86
Wire rope	135	141	254
Insulated iron or steel wire and cable	3	58	18
Other wire and manufactures	165	160	345
Wire nails	496	781	585
Tacks	44	32	35
Other nails, including staples	272	355	288
Bolts, machine screws, nuts, rivets and washers	205	224	495
Total, these 12 classifications	6,981	8,150	13,913

Imports of iron and steel wire and wire products into the United States
(In gross tons)

Concrete reinforcement and other bars	6,638	6,059	6,074
Wire rods	388	276	669
Barbed wire	909	1,390	606
Round iron and steel wire	183	223	258
Telephone and telegraph wire	5		
Flat wire and strip steel	85	84	48
Wire rope and strand	217	202	160
Other wire	69	112	16
Hoops and bands	1,989	1,889	1,390
Nails, tacks and staples	751	955	750
Bolts, nuts and rivets	10	11	72
Total, these 11 classifications	29,607	11,201	10,043

EXPORTS of iron and steel products in May rose 38.4 per cent as compared with April. The increase, however, was due primarily to shipments in scrap and skelp. Japan, because of her large purchases of these products was the leading factor during the month. Canada took 1447 tons of hoops and China purchased 1276 tons of tin plate.

✦ ✦ ✦

IMPORTS for May exceeded the April total of 3,412 tons but the trade was still less than that of March. Among the principal increases in imports were concrete reinforcement bars and scrap.

✦ ✦ ✦

IMPORTS from Belgium included 3,168 tons of concrete reinforcement bars and 1099 tons of merchant steel bars. Receipts from Germany included 731 tons of barbed wire, 694 tons of nails and 530 tons of hoops. Imports from France included 1340 tons of concrete reinforcement bars and 743 tons of hoops.

✦ ✦ ✦

RECEIPTS of card clothing rose to 12,412 square feet, valued at $11,681, of which 11,258 square feet ($10,011) came from the United Kingdom and the rest from Germany and France, in that order.

✦ ✦ ✦

WIRE cloth and screening imports, at 25,216 square feet, were greater than in April; 13,771 square feet came from Germany, 7,660 square feet from France, 3,440 square feet from Canada, and the rest from the Netherlands.

✦ ✦ ✦

FOURDRINIER wire imports, however, were only two-thirds as large as in April; the 62,891 square feet came from Germany (25,965 square feet); Austria (17,155 square feet); France (15,331 square feet); and Sweden (4,440 square feet).

✦ ✦ ✦

WIRE fencing and netting imports were smaller in May; that galvanized before weaving totaled 2,147,575 square feet (1,654.575 square feet from Germany, 407,000 square feet from Belgium, and 86,000 square feet from the Netherlands), and that galvanized after weaving aggregated 4,606,625 square feet (1,930,000 square feet from Belgium, 1,231,975 square feet from Germany, and 1,444,650 square feet from the Netherlands).

✦ ✦ ✦

WIRE heddle imports, at 500,000, were only fractionally as great as in April and were supplied entirely from France.

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New Copper Refinery For Northern Rhodesia

A PLANT for the refining of copper produced in Northern Rhodesia will be built near Liverpool, England, according to information received here yesterday. British Insulated Cables, Ltd., it is understood, will start at once construction of the plant, which will have a initial monthly capacity of 2,500 to 3,000 tons of fire-refined copper and be in operation early next year.

It is reported that Roan Antelope Copper Mines, Ltd., a large producer in Northern Rhodesia, will have an interest in the plant. Tests of that company's blister copper show that after simple fire refining it can be drawn into wire.

It is expected in the copper industry here that Great Britain, after the coming conference in Ottawa, Ont., will put a tariff on copper to protect Empire production. It is believed also that the 4-cent duty on copper coming into this country, which will go into effect today, is partly responsible for the construction of the English refinery. In the last few weeks there has been a heavy movement of copper into this country to avoid paying the duty.

In the last few days there has been a somewhat better demand for copper abroad. Recent sales were estimated at 1,250,000 pounds, compared with 1,500,000 pounds on previous sales. Domestic buying, however, continues small with the price of electrolytic copper unchanged at 5⅜ cents a pound delivered until the end of 1932. European destinations are at levels corresponding to 5.30 to 5.50 cents a pound c. i. f. Hamburg, Havre and London.

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PROCESS CONTROL IN THE MANUFACTURE OF RUBBER COVERED WIRE
By E. G. Sturdevant, United States Rubber Co., Bristol, R. I.

PLANT MANAGEMENT
By John C. Callaghan, Works Manager, Canada Works, Steel Co. of Canada, Hamilton, Ont. Canada.

COST ACCOUNTING
By R. F. Cohn, Secretary, The Reynolds Wire Company, Dixon, Ill.

PATENTING
By R. B. Whyte, General Supt., The MacWhyte Company, Kenosha, Wis.

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New Machinery

United Engineering & Foundry Co. Introduces Perrett Rod Mill

UNITED Engineering & Foundry Company has acquired an exclusive license for the manufacture and sale of the Perrett rod reel, a new invention. It is a swivel-type double-bucket reel, self discharging, requiring no stripper or kick-off, and running continuously without stopping.

✦ ✦ ✦

INSTEAD of the customary vertical shaft and pins used in the conventional pin reel, the machine has two cored buckets, one on each end of a vertical drive. The rod is delivered through a pipe guide to the upper bucket, which rotates continuously, and is laid up in regular layers as a coil. As soon as the end of the rod has arrived, the entire coiling assembly, which is mounted on trunnions, is rotated vertically, interchanging the two buckets. The lower bucket is immediately brought into the upper, or receiving position, and is rotating in the same direction as the previous one.

The loaded bucket, with its finished coil, travels to the lower or inverted position, and the coil is deposited upon the conveyor ready for wiring or further treatment.

✦ ✦ ✦

TO retain the coil during the swivel motion a set of coil arms extend over the open top of each bucket with guide rollers to protect the coil from damage. The coil arms remain in this position until the bucket is completely inverted and is ready for discharge, whereupon they are thrown back and the coil falls gently upon a conveyor or chute or other delivery device. The opening and closing of the coil arms may be automatic or controlled by small air cylinder.

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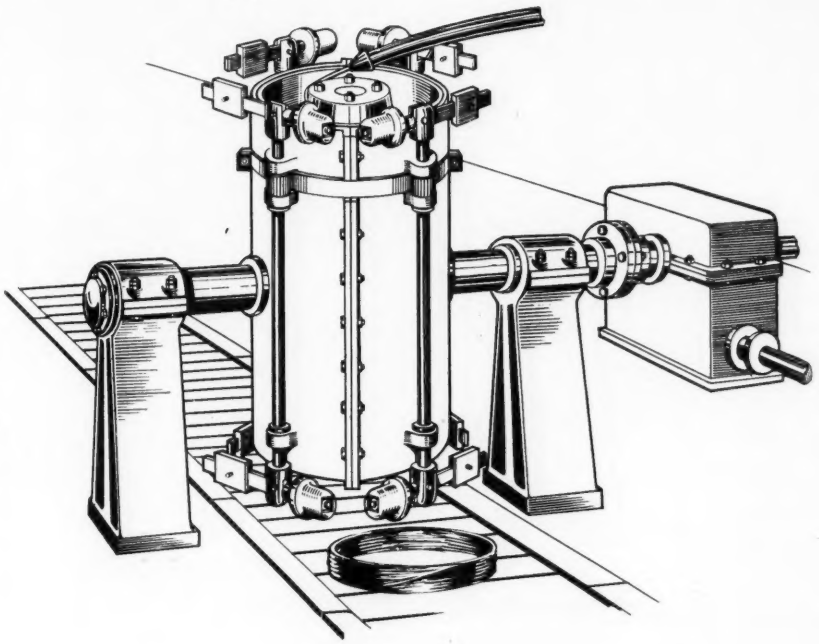
A MACHINE of this kind will do nearly twice as much work as the average reel, being in almost continuous operation. Buckets can be for any size of coil, and easily changed from one size to another. The machine will not cause breaks or flat spots on the rods. It lessens the expense and the maintenance cost of strippers and kickoffs and it simplifies the conveyor. The coil boy need not start or stop the machine.



✦ ✦ ✦

THE reel enables the operating man to turn out more tonnage with much less of an investment and less floor space requirement and because it delivers the rods as smooth and straight as they are rolled with nothing to hold up his mill. To the maintenance man it is a simple machine, very accessible, with no complicated parts and less mechanism than the average machine now in use. It may be used singly or as one unit in a battery of reels, depending upon the output of the mill.

✦ ✦ ✦

A Formula for Finding the Open Area of Wire Cloth

THE formula that is generally used for finding the open area of wire cloth is somewhat cumbersome because it goes at the problem "backwards". It gives us the closed area, and then we are told to subtract that area from one (1). The answer will be correct, of course, but the method is clumsy. The following formula gives the open area directly:

$$\text{Open area} = (1 - ND)\ (1 - nd)$$

where N = number of wires in the warp per inch;

n = number of wires in the shoot per inch;

D = diameter of wires in the warp;

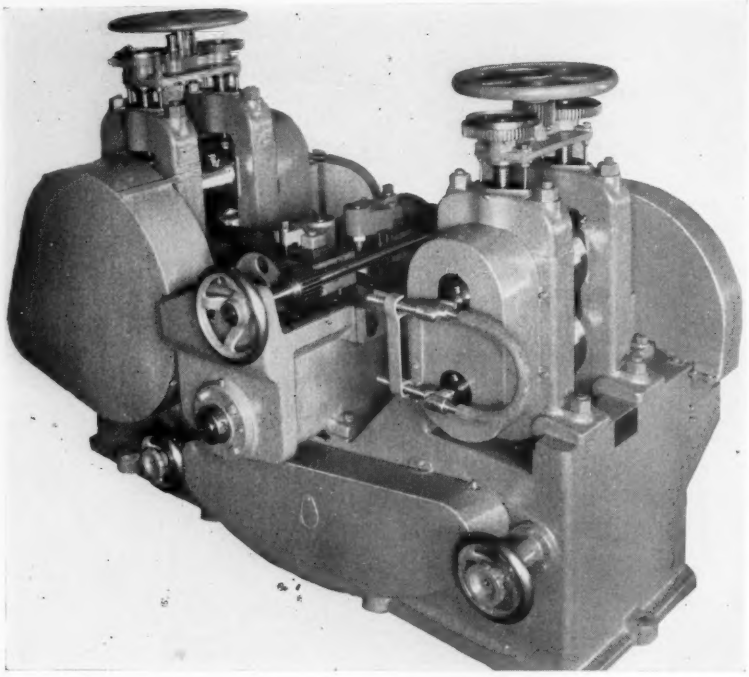
d = diameter of wires in the shoot.

To accomplish the same purpose the "old" formula, revised somewhat, would be as follows:

$$1 - ND\ (1 - nd) - nd$$

where the meaning of the symbols is the same as given above. Both formulas give the same result, to be sure, but the first is certainly simpler, is it not?

Flat Wire Rolling Mill



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High Tension Cable Production

(*Continued from page 251*)

3.- How can other voids, such as those due to paper registration during taping or due to many and poor paper end connections when paper breaks or pad runs out, etc., be eliminated?

IT is not possible to answer this question completely in this article, but the principal facts are as follows — Paper registration during taping can be caused by many faults of the taping machine, for instance; a void will occur:

1. If the speeds of taping heads vary; that is, if one taping head rotates faster or slower than the other. (Variable transmission).

2. If the tape is forced out of its adjusted position by some means. (Centrifugal force, poor paper tape guides, etc.)

3. If the tension in the tape varies too much during taping.

4. If there is too much backlash in the taping head and capstan drive.

5. If the cable does not remain in the center of the machine during the taping. Cable must have good support in order to keep it from swinging.

All these faults of the machine will make the tape register VOIDS during the taping operation.

✦ ✦ ✦

What Are the Results of Poor Paper Registration?

1. When one or more tapes are placed directly on top of another a large void will result and the cable will be weakened mechanically.

2. Voids will be caused if the tapes are not equally spaced—in some places the tape will be spaced too far apart; in other places too close together and in still other places, tapes will overlap. The last two conditions are inclined to create wrinkles when bending the cable.

3. It is possible that when the tape is being forced out of its proper position due to centrifugal force or insufficient tape guides so that the tape can not lie smoothly against the cable, that pockets will be created.

4. It is also possible that when the cable is not supported properly in the center of the machine, the distance from the last guide roll to the point of application will change frequently and the angle of application be so forced to change and pockets created.

✦ ✦ ✦

DUE to these conditions, the taping machine should have the following features:

(a) The greatest possible number of large pads in order to decrease the number of binding laps to a minimum. Every binding lap means a void.

(b) A satisfactory method of leading the tape from the pad to the point of application, so that the middle axis of the tape remains at a 90° angle to the middle axis of the guide rolls.

(c) A self-adjustable angle of application so that if the speed of the cable-advance is changed during the operation, the angle of application will change automatically.

(d) The most uniform tension possible—a tension which can be set properly while the machine is standing still and which will not change appreciably during the operation. Every tension device should be equipped with a scale showing the tension in pounds and ounces.

(e) A quick automatic stop so that when the paper breaks or the pad runs out, the machine will stop instantly.

(f) A uniform advance of the cable through the machine. Any backlash or possible slippage must be eliminated.

(g) A taping machine built as short as possible and still allowing sufficient space for the operator to handle and watch the tapes.

✦ ✦ ✦

THERE are many different opinions among manufacturers and engineers about how to combine all these features in a given machine, and due to this

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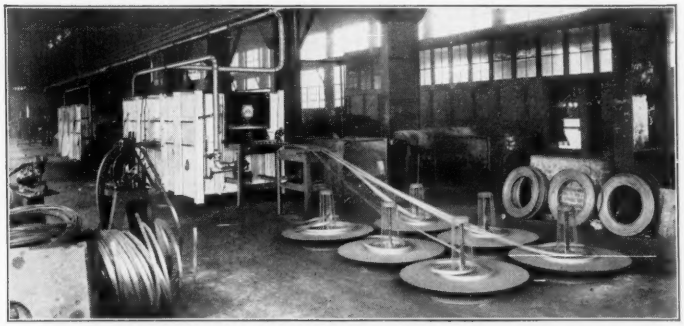

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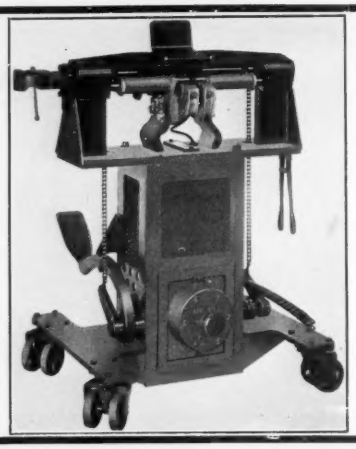

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ANNOUNCEMENT

THE JOHNSON SUPER PRODUCTION TUBING AND STRAINING MACHINES, and the application of the HIGH PRODUCTION FEATURES applicable to other tubing machines, will in the future be manufactured and sold in sizes up to 4 inch worm diameter, by the New England Butt Co., of Providence, Rhode Island, under exclusive license from the patentee.

We bespeak for the New England Butt Co., (who have our assurance of hearty cooperation and expert assistance), a continuation of the keen interest and liberal patronage extended us in the past.

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Edgar H. Johnson, Patentee

2 MODELS PATCH VULCANIZERS FOR REPAIRING RUBBER COVERED WIRES OR CABLES

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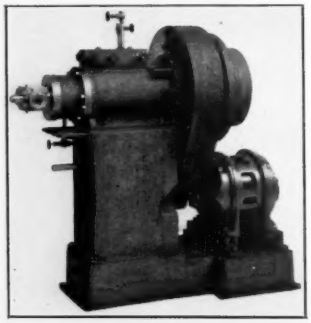
.125", .160", .180", .1875", .200", .225", .250", .275", .300", .3125", .320", .350", .357", .375", .400", .417", .425", .4375", .488", .500", .529", .576", .625", .684", .750", .875", 1.000", 1.125", 1.250", 1.375", 1.500".



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fact many different machines have been built. So far, most of them have been far from perfect either in design or operation.

To summarize—Conductors insulated with machines containing all the features mentioned above and with skillful operation can be cabled without danger of creating wrinkles.

✦ ✦ ✦

A pre-heating of the conductors before cabling would not be necessary, providing the paper does not contain too much moisture, and with proper operating rooms, this moisture content could be kept as low as 3%.

In the next article we will discuss:—

4.- To what extent will the previous operations, if carried out as mentioned above, affect the drying and impregnating process in regard to the quality of the cable?

✦ ✦ ✦

New Principle Applied in Bright Annealing Copper Wire

(*Continued from page 254*)

radiation. To be sure a small amount of heat will travel by conduction through points of contact of the spools with the retort and of the retort with the furnace and also through the wire through the outer layers toward the core of the spool. A still smaller amount of heat will be convected by the inert gases within the retort due to their propulsion under stack action. On the other hand, these inert gases seriously impede the more essential radiant transfer of heat.

✦ ✦ ✦

THEREFORE, in order to radiate a sufficient volume of heat to provide an annealing temperature within the wire itself within a reasonable time period, it is obligatory to maintain a large temperature differential between the furnace and the wire. This results in complicating the very important element of "control". "Control" may no longer be intrusted

to a reliable pyrometer alone but is interlocked with many factors:

1. **Temperature of furnace**
2. **Gauge of wire**
3. **Weight of spools**
4. **Physical size of spools**
5. **Time allowed in furnace**

On the other hand, in the new gas-fired convection heating annealer the item of "control" is primarily vested in a temperature recorder controller with the elimination of 80% of the interlocking factors incident to the operation of a radiant heat annealer.

✦ ✦ ✦

Factors Pertaining to Spool Sizes

VERY important are the factors pertaining to spool sizes in a radiant heat type of furnace and even when like gauge sizes are treated on similar spools, the outer layers of wire take a higher temperature than the innermost layers, resulting in non-uniformity. In the case of the gas-fired convection annealer the maximum rate of temperature rise can be and is limited to the speed at which the heat will uniformly penetrate the spools of wire so that all of the wire reaches an annealing temperature within the space of a very few minutes. This precludes the possibility of "stickiness" brought on by prolonged soaking of any part of the spool at temperatures above which molecular intergrowth between adjacent strands of wire is likely to occur. Elimination of the factors which are liable to produce "stickiness" has permitted the use of much larger spool sizes for a given gauge size than has ever been successfully employed in other annealers. Specifically the gas-fired convection heating annealer has demonstrated its superiority over the radiant heat type in its ability to handle different gauges of fine wire on spools ranging from 5 to 65 pounds in weight, in the same charge subject to the same annealing cycle. Heavy copper wire up to No. 8 in loose bundles has been placed in this furnace with No. 36 gauge on 10 pound spools. All of the wire came out of the furnace

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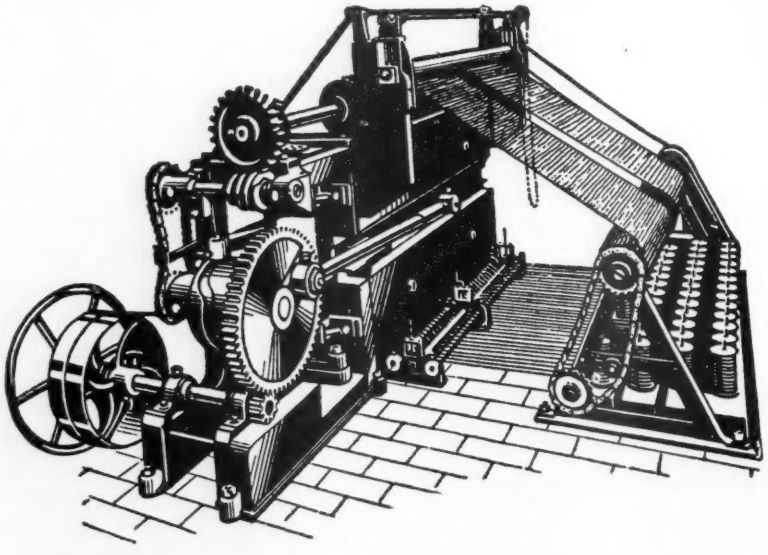
Heavy Hexagonal Wire Netting in Germany

HEXAGONAL mesh poultry wire netting has been found to be of little use where a strong netting is required, as this hexagonal netting is usually manufactured in thin gauges only, the thickest being BWG 16 and very rarely BWG 15. As a result chain link fencing, square netting, etc., has been generally used for fencing as the thin gauge hexagonal netting did not give sufficient protection.

TO meet these conditions the HORN A. G. fur Apparate und Maschinenbau of Worms a. Rh. has recently developed a new machine which gained a rapid hold in Germany and other European countries. This machine has revolutionized netting production to the point that a thick hexagonal netting is now available and in extensive use.

This machine produces netting from galvanized wire or from wire



THE square netting has been found to have the disadvantage of opening up the whole fence when one wire is cut through, as the mesh then comes apart. There is also general complaint that the zinc surface does not hold well on this type of netting.

galvanized after drawing in widths of from 2 inches to 4 inches, and up to 11 BWG thickness. The machine itself is designed exclusively for the manufacture of hexagonal shaped meshes in accordance with the tables shown herewith.

bright, and uniformly annealed to the desired ductility.

✦ ✦ ✦

THE radiant heat, retort type furnace is naturally limited as to size, whereas the gas-fired, convection heat type will operate efficiently regardless of size; which can be increased to meet the production schedules of any plant.

✦ ✦ ✦

"Haveg"

A RECENT article in Draht-Welt describes a new material, "Haveg" by name, which it is said has been getting a foothold in the wire mills of Europe in the form of acid vats for the cleaning house and for galvanizing units.

"Haveg" is described as being somewhat of the nature of Bakelite with an admixture of asbestos. It is claimed to resist perfectly muriatic and phosphoric acids in any concentration, sulphuric up to 50% strength, organic acids, metallic chlorids, ammonia, lime water, the carbonates of soda and potash, neutral soap solutions and all the common organic solvents including the petroleum products and alcohols. A special grade of "Haveg" resists hydrofluoric acid. The materials against which it affords insufficient resistance are alkalis, organic bases, strong sulphuric acid and oxidizing agents.

"Haveg" has good mechanical properties, including a compressive strength of about 12000 lbs. per sq. in., great flexibility and resistance to impact. Its specific gravity is 1.6, lighter than aluminum. It is unaffected by temperature changes in any practical working range.

The material, while generally molded to shape, can be planed, drilled, sawed or finished by grinding. The surface is very smooth.

✦ ✦ ✦

Mr. J. F. Schrumn, formerly Technologist of the Process Engineering & Equipment Corp., who has had wide experience in this line, is now connected with the Electric Furnace Company at Salem, Ohio.

Wire Galvanizing Processes

(*Continued from page 258*)

THE old standard technique of hot galvanizing wire ran very much along the following lines—lead annealing, muriatic cleaning, in some instances wash and flux, thence through shallow underfired or too low fired pans and wiping. This old style technique involved many of the human element phases to which I have referred. The control of the lead, the strength and iron content of the acid and flux, the control of floating dross in the kettle and the manipulation of the wipes were all dependent upon the ability and keenness of the operator. The most serious difficulty with this technique was the inability to control the width of the interlining alloy layers to guard against flaking. This difficulty was eliminated by the introduction of the neutral flux technique which brought to the kettle a wire free from iron salts and the installation of deep side-fired kettles which not only eliminated the upward thrust of dross in the kettle but actually produced a much desired downward thrust. These changes produce a thorough constancy in the condition of the galvanizing area of the bath which results in a product of great uniformity and flexibility.

✦ ✦ ✦

THE latest technique, however, to which I have referred before eliminates the use of the costly lead pan, eliminates the use of acids and fluxes and combines in one operation the annealing and galvanizing of the wire in a thoroughly and automatically controlled unit. The temperature of the galvanizing kettle will be maintained by the wire itself. Therefore in the up-to-date process of hot galvanizing there is only one step in the technique open to variation by the operator and that is the wiping, to which attention is now being given.

✦ ✦ ✦

IN regard to the commercial aspects of the electroplating process, I wish to quote Mr. Eckel-

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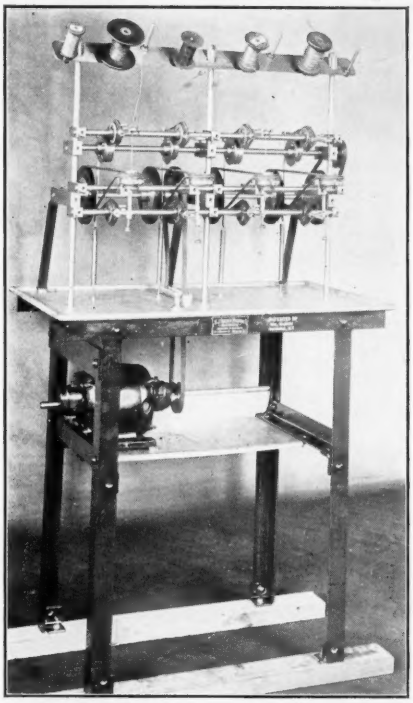

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mann—"The main objections to the use of electro galvanizing are as follows: First, that as the entire process is more complicated, and secondly, a greater number of variables must be maintained within rather close limits for successful results, there is the possibility of any error or change seriously affecting the final result. For example, the cleaning operations used first to remove the oil and then pickling must be thorough, as an unclean surface will produce unsatisfactory deposits. Secondly, the current, temperature, composition and condition of the electrolyte, position and condition of the anodes also require careful attention. Any change in the electrolyte will produce spongy, brittle or rough deposits, as the case may be. Another serious limitation to the use of electro-galvanizing, is the high cost of the elaborate eqiupment necessary. In fact, with the present processes there are physical limitations to the amount of zinc that can be deposited as the common electrolytes now in use limit the maximum current densities, and therefore greatly increase the time for producing heavy deposits."

OBITUARY

James McWilliams, vice-president and treasurer of the Watson Machine Co., of Paterson, N. J. died of heart trouble at his home Thursday, July 21st.

Mr. McWilliams who was 66 years old, was born in Paterson, N. J. and entered the employ of the Watson Machine Company over fifty years ago.

He rose from office boy to vice-president and treasurer and recently observed his fiftieth anniversary with the company.

He was vice-president of the Franklin Trust Co. of Paterson and at one time served as a member of the Fire and Police Commission.

Among his clubs were the Hamilton club, Elks and Elmwood Country club. He was also a member of St. Joseph's Holy Name Society.

Surviving Mr. McWilliams are his widow, Etta, and three sons: Rev. Raymond McWilliams, Rev. Leroy McWilliams, and Lieutenant James H. McWilliams of the United States Navy.

Mr. McWilliams was perhaps one of the best known men of the wire industry, numbering among his friends many of the older men of the industry as well as most of those of the younger generation and his passing will create a keen sense of loss among those who numbered him as an acquaintance and friend.

The Paterson Evening News in commenting on Mr. McWilliams says "His life should prove an inspiration to all who admire the finer things, who respect honesty, courage, efficiency and idealistic citizenship."

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Seymour Mfg. Co., Seymour, Conn.

WIRE—Various Kinds
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted Insulated Wire Co., Winsted, Conn.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

Announcing the Establishment of a Translation Bureau By Wire and Wire Products

This translation service is under the supervision of trained engineers familiar with the rod, wire and strip industry.

All translations will be technically correct

For further information address

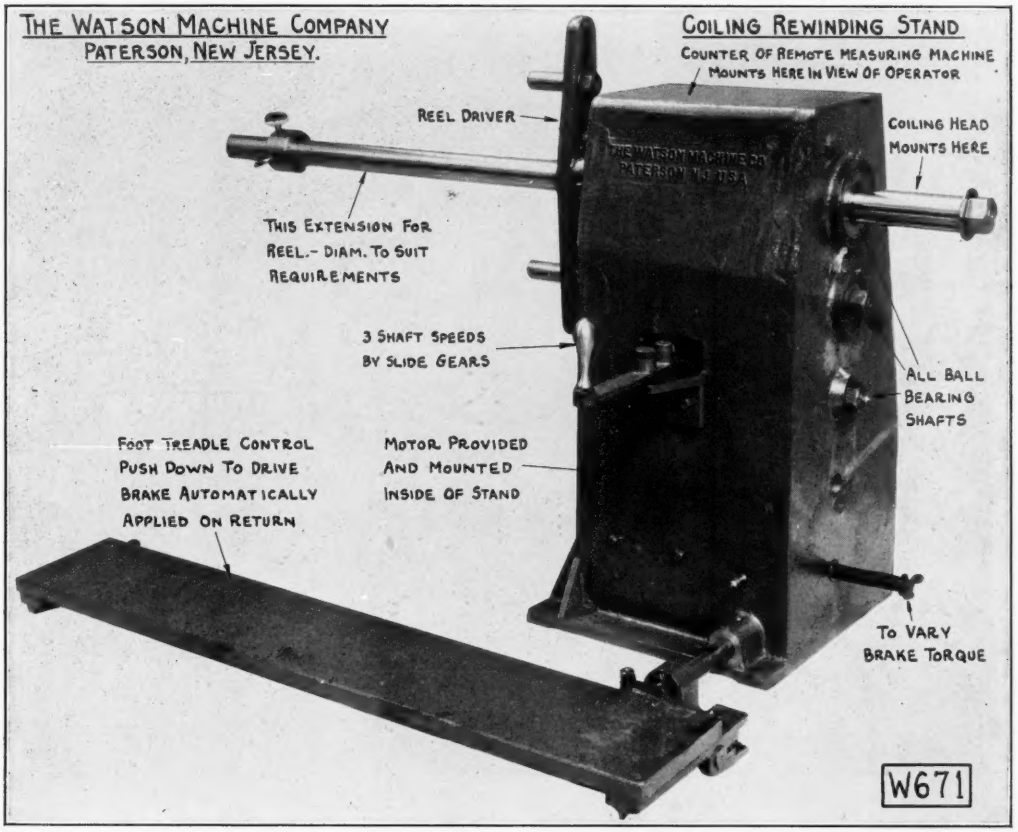
Translation Bureau, Wire and Wire Products : : : 551 Fifth Avenue, New York, N. Y.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

REWINDING-COILING STAND and COILING HEAD


THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY.
COILING REWINDING STAND
COUNTER OF REMOTE MEASURING MACHINE MOUNTS HERE IN VIEW OF OPERATOR
REEL DRIVER
COILING HEAD MOUNTS HERE
THIS EXTENSION FOR REEL.- DIAM. TO SUIT REQUIREMENTS
3 SHAFT SPEEDS BY SLIDE GEARS
ALL BALL BEARING SHAFTS
FOOT TREADLE CONTROL PUSH DOWN TO DRIVE BRAKE AUTOMATICALLY APPLIED ON RETURN
MOTOR PROVIDED AND MOUNTED INSIDE OF STAND
TO VARY BRAKE TORQUE
W671

THIS IS AN IDEAL UNIT FOR SHIPPING ROOM AND WAREHOUSE USE, combining Coiling and Reeling in the minimum of space.

Installation cost reduced to that of wiring to the unit, as motor is provided installed inside of the stand.

Three speeds are quickly obtained by the slide gear change lever.

Main reel shaft is of heat treated steel, and reels whose weight in pounds multiplied by their overall width in inches does not exceed 75,000, can be carried without outer end support.

All shafts are ball bearing, and gears are cut.

The foot treadle with automatic brake results in an extremely sensitive control, ideally suitable for this operation.

MORGAN
WORCESTER

ENGINEERS AND MANUFACTURERS

ROLLING MILLS GAS PRODUCERS WIRE MACHINERY
COMBUSTION CONTROLS

THE MORGAN-CONNOR WIRE MACHINE

scores these advantages over single hole blocks:

OUTPUT PER MAN ranges 1.5 to 3 times higher.

FLOOR SPACE per unit output is 1/2 to 2/3 as much.

HANDLING simplified by eliminating lifting of process wire and by forcing a good trucking layout.

SAFETY assured by automatic stops which are the operating details of the machine and are always in working order.

MANUAL LABOR is lightened because process wire is not lifted.

INVESTMENT per unit of product averages lower for these machines than for single draft equipment.

QUALITY OF PRODUCT. Of 55 users more than half have reordered. Market wire is drawn to exacting specifications on Morgan-Connor machines.

FLEXIBILITY of these machines carries their range from the lightest standard rope wire drafting to the heaviest that soft basic will stand. Machines geared for non-stop operation by welding retain a large measure of flexibility.

AIR COOLING has made possible higher drawing speeds. It has doubled the permissible speed on high carbon wires and distinctly improved uniformity of torsion tests throughout the bundle.

Morgan Construction Company
WORCESTER, MASS., U. S. A.

Malmedie & Company, Dusseldorf, Germany
Sole Licensee for Morgan-Connor Wire Machines in Europe